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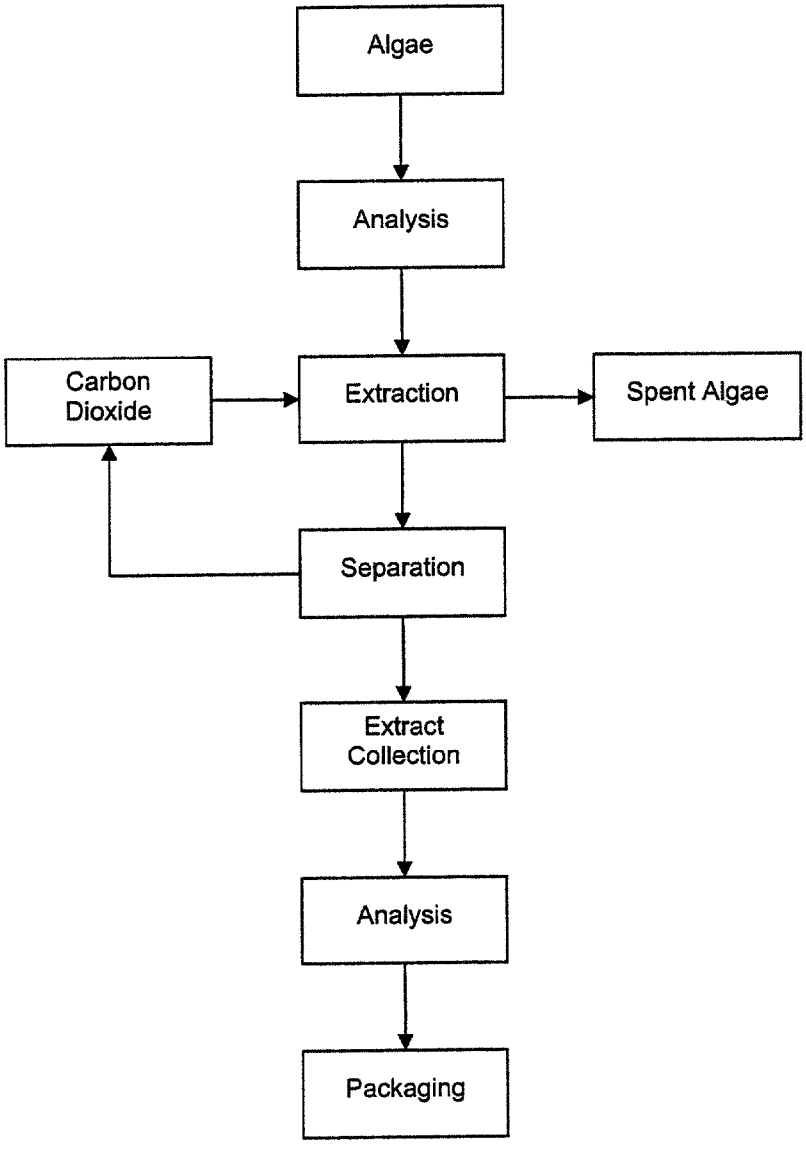
2751 Nutra Lane Eustis, FL 32726 main: 352.357.2004 toll free: 877.876.8872 fax: 352.483.2095 www.usnutra.com

Astaxanthin-Complex Carotenoid Oleoresin

Production Diagram



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ASTAXANTHIN-COMPLEX CAROTENOID OLEORESIN

Extraction Procedure

Commercially available dried and ground *Haematococcus* algae is procured from producers in Hawaii, Israel or Sweden and received in 10, 15 or 25 kg vacuum-sealed aluminum pouches. The algal meal is extracted in a standard unmodified commercial Supercritical Fluid Extraction facility (Uhde Hochdrucktechnik, Hagen, Germany) comprising 3 x 150 litre extractors and 3 x 100 litre separators. The entire facility is designed to operate under the GMP directive for Dietary Supplements proposed by FDA for the United States.

1. Dried, cracked *Haematococcus* algae meal sealed in airtight pouches is obtained for extraction and analyzed for astaxanthin concentration.

2. Stainless steel baskets are filled with algae meal and placed into a high pressure extraction vessel.

3. Clean food-grade carbon dioxide (without chemical co-solvents or entrainers) in the supercritical state (500 – 700 bar ; 40 – 80°C) is passed through the extraction baskets to "load" astaxanthin, other carotenoids and lipids from the algae into the CO_2.

4. The loaded carbon dioxide passes into a separation vessel under lower pressure and temperature (50 – 220 bar ; 15 – 30°C) to transform the CO_2 into the gas phase and separate it from the astaxanthin-rich carotenoid oleoresin.

5. The astaxanthin-rich carotenoid oleoresin is drawn off the separator vessel through a valve and collected in portable covered stainless steel vessels.

6. Carbon dioxide is recovered and recycled.

7. Fully extracted "spent" algae is removed from basket to complete the extraction cycle.

8. Astaxanthin-complex carotenoid oleoresin collected from the separation vessel is analyzed for astaxanthin content, packaged in sealed airtight food-grade HDPE or stainless steel containers and stored at low temperature (2 – 10°C).